PRICING UNDER FAIRNESS CONCERNS

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CUSTOMERS & FIRMS CARE ABOUT FAIR PRICES

- evidence from marketing, psychology, sociology, economics
- but pricing models never invoke fairness

$\rightsquigarrow$ pricing models do not have realistic microfoundations

  - particularly problematic as these models are used for policy
  - example: Calvo pricing & monetary policy

- exception: theory by Rotemberg [2005]
  - but somewhat difficult to analyze & port to other models

THIS PAPER: TRACTABLE THEORY OF FAIR PRICING

- firms set prices to maximize profits given that
  - customers care about the fairness of markups
  - customers systematically misperceive markups
- in monopoly model:
  - price rigidity (incomplete passthrough of costs into prices)
- in New Keynesian model:
  - short-run & long-run nonneutrality of monetary policy

EVIDENCE THAT FAIRNESS MATTERS

FIRMS ATTRIBUTE PRICE RIGIDITY TO FAIRNESS

- 12,000 firms in the US, Canada, Europe, Japan say that they "tacitly agree to stabilize prices, perhaps out of fairness to customers"
  - Blinder et al [1998], Fabiani et al [2005], etc.
- median rank of macro theories of price rigidity:
  - nominal contracts: 3/11
  - menu costs: 9/11
  - informational frictions: 11/11

HIGHER PRICE DUE TO HIGHER MARKUP IS UNFAIR

- Kahneman, Knetsch, Thaler [1986]: “A hardware store has been selling snow shovels for $15. The morning after a large snowstorm, the store raises the price to $20.”
  - acceptable: 18%
  - unfair: 82%

BUT HIGHER PRICE WITH SAME MARKUP IS FAIR

- Kahneman, Knetsch, Thaler [1986]: “Due to a transportation mixup, the wholesale price of lettuce has increased. A grocer has bought lettuce at a price that is 30 cents per head higher than normal. The grocer raises the price of lettuce to customers by 30 cents per head.”
  - acceptable: 79%
  - unfair: 21%

FIRMS UNDERSTAND NORMS OF FAIRNESS

- Blinder et al [1998] surveyed 300 firms in the US
- 64% of firms: “customers do not tolerate price increases after increases in demand”
- 71% of firms: “customers do tolerate price increases after increases in cost”

EVEN GOD CARES ABOUT MARKUPS

- Talmudic law: maximum markup allowable in trade = 20%
- legal texts also regulate markups:
  - price of bread in France, 1700 – 1970
  - public utilities in the US
  - anti-price-gouging legislation in most US states

MONEY ILLUSION SUGGESTS MISINFERENCE

- Shafir, Diamond, Tversky [1997]: “Imagine that within a six-month period all salaries and all prices went up by 25%. You now earn and spend 25% more than before. Six months ago, you were planning to buy a leather armchair whose price during the 6-month period went up from $400 to $500. Would you be more or less likely to buy the armchair now?”
  - as or more likely: 62%
  - less likely: 38%

MONOPOLY MODEL

WITH FAIRNESS CONCERNS

CUSTOMERS

- given price of consumption P, wealth W, and fairness function F
- choose money balances B and consumption Y
- to maximize quasilinear utility

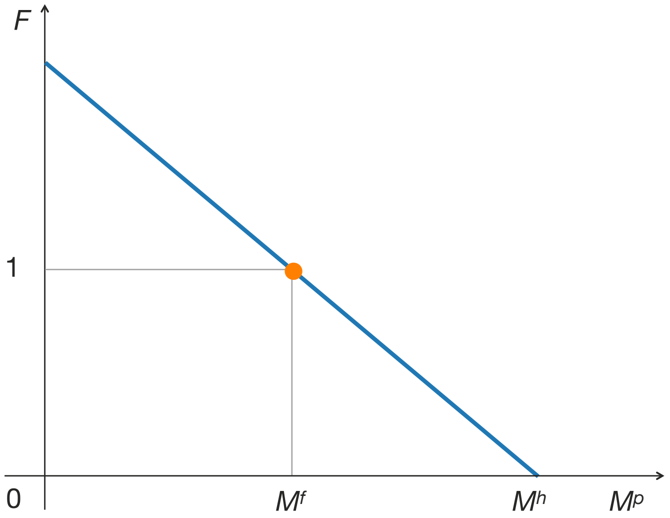
$$\frac{\epsilon}{\epsilon-1}(F\cdot Y)^{(\epsilon-1)/\epsilon}+B$$

- subject to budget constraint $B+P\cdot Y=W$
- different from social-preference approach to fairness
  - Rabin [1993] $\rightsquigarrow$ Rotemberg [2005]

FAIRNESS FUNCTION F

- argument: perceived markup $M^p = P/C^p$
  - P: observed price
  - C^p: perception of hidden marginal cost
- positive: $F(M^p) > 0$
- decreasing: $F'(M^p) < 0$
  - higher markups are less fair
- linear or concave: $F''(M^p) \leq 0$
  - stronger response to increases in price than decreases

EXAMPLES OF FAIRNESS FUNCTION



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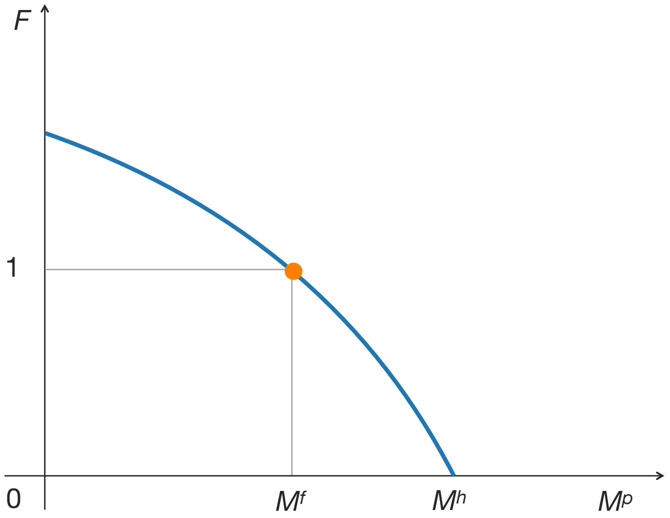


PERCEIVED MARGINAL COST

$$C^p(P) = (C^b)^\gamma \cdot \left[\frac{P}{\epsilon/(\epsilon-1)}\right]^{1-\gamma}$$

- C^b: prior belief about monopoly's marginal cost
- $P/[\epsilon/(\epsilon-1)]$: marginal cost with rational customers
- $\gamma \in (0,1]$: amount of misinference
  - $\gamma = 0$: rational inference
  - $0 < \gamma < 1$: some inference, but less than rational
  - $\gamma = 1$: no inference

PERCEIVED MARKUP

$$M^p(P) = \frac{P}{C^p(P)} = \left(\frac{\epsilon}{\epsilon - 1}\right)^{1-\gamma} \left(\frac{P}{C^b}\right)^{\gamma}$$

- misinference ($\gamma > 0$): M^p increasing in P
  - when a price rises due to a cost increase, customers partially misattribute the higher price to a higher markup
- rational inference ($\gamma = 0$): constant M^p
  - when a price rises due to a cost increase, customers realize that the profit-maximizing markup is constant

DEMAND CURVE

$$Y^d(P) = P^{-\epsilon} \cdot F(M^p(P))^{\epsilon-1}$$

- $P^{-\epsilon}$: traditional effect of price on demand
  - price $\rightsquigarrow$ customers' budget sets $\rightsquigarrow$ demand
- $F(M^p(P))^{\epsilon-1}$: effect of price on demand through fairness
  - price $\rightsquigarrow$ perceived markup $\rightsquigarrow$ perceived fairness $\rightsquigarrow$ marginal utility of consumption $\rightsquigarrow$ demand

MONOPOLY

- given marginal cost of production C
  - unobservable to customers
- chooses output Y and price P
- to maximize profits $Y \cdot (P - C)$
- subject to customers' demand $Y = Y^d(P)$

PROFIT-MAXIMIZING PRICE

- profit-maximizing price:

$$P = M \cdot C$$

- M: profit-maximizing markup

$$M = \frac{E}{E - 1}$$

- E: (positive) elasticity of demand wrt price

$$E = -\frac{P}{Y^d} \cdot \frac{dY^d}{dP}$$

PRICE ELASTICITY OF DEMAND

- $Y^d(P) = P^{-\epsilon} \cdot F(M^p(P))^{\epsilon-1}$
- price elasticity of perceived markup = γ
- $\phi(M^p)$ = (positive) elasticity of fairness function wrt markup
- then we obtain:

$$E(P) = \epsilon + (\epsilon - 1) \cdot \gamma \cdot \phi(M^p(P))$$

- fairness operates through term $(\epsilon - 1) \cdot \gamma \cdot \phi(M^p(P))$ in price elasticity of demand

ELASTICITY OF FAIRNESS FUNCTION WRT MARKUP

$$\phi(M^p) = -\frac{M^p}{F(M^p)} \cdot \frac{dF}{dM^p}$$

- $\phi > 0$
  - because $F > 0$
  - and $F' < 0$
- ϕ increasing in M^p
  - because F is decreasing in M^p
  - and $-F'$ is weakly increasing in M^p (concavity of F)

NO FAIRNESS CONCERNS $\rightsquigarrow$ FLEXIBLE PRICES

$$E(P) = \epsilon + (\epsilon - 1) \cdot \gamma \cdot \underbrace{\phi(M^p(P))}_{=0}$$

- standard price elasticity of demand: $E = \epsilon$
- standard markup: $M = \epsilon/(\epsilon - 1)$
- passthrough of marginal costs into prices = 100%
  - because markup is constant

RATIONAL INFERENCE ⇝ FLEXIBLE PRICES

$$E(P) = \epsilon + (\epsilon - 1) \cdot \underbrace{\gamma}_{= 0} \cdot \phi(M^p(P))$$

- standard price elasticity of demand: $E = \epsilon$
- standard markup: $M = \epsilon/(\epsilon - 1)$
- marginal-cost passthrough = 100%
  - because markup is constant

FAIRNESS & MISINFERENCE $\rightsquigarrow$ MORE COMPETITION

$$E(P) = \epsilon + (\epsilon - 1) \cdot \underbrace{\gamma}_{>0} \cdot \underbrace{\phi(M^p(P))}_{>0}$$

- price elasticity of demand is higher: $E > \epsilon$
- markup is lower:

$$M = \frac{E}{E - 1} < \frac{\epsilon}{\epsilon - 1}$$

FAIRNESS & MISINFERENCE $\rightsquigarrow$ PRICE RIGIDITY

- equilibrium markup is a fixed point:

$$M = \frac{E(M \cdot C)}{E(M \cdot C) - 1}$$

- equilibrium markup satisfies

$$M = 1 + \frac{1}{\epsilon - 1} \cdot \frac{1}{1 + \gamma \cdot \phi(M^p(M \cdot C))}$$

$\rightsquigarrow$ marginal-cost passthrough < 100%

  – because markup $\downarrow$ when marginal cost $\uparrow$

EVIDENCE OF INCOMPLETE PASSTHROUGH

- labor-cost shocks in Sweden: passthrough = 30%
  - Carlsson, Skans [2012]
- reduction in import tariff in India: passthrough = 30%–40%
  - De Loecker et al [2016]
- marginal-cost shocks in Mexico: passthrough = 20%–40%
  - Caselli, Chatterjee, Woodland [2017]
- energy-price shocks in the US: passthrough = 50%–70%
  - Ganapati, Shapiro, Walker [2020]

NEW KEYNESIAN MODEL WITH FAIRNESS CONCERNS

FAIRNESS CONCERNS

- fairness-adjusted consumption of good i by household j:

$$Z_{ij} = F_i(M_i^p(P_i)) \cdot Y_{ij}$$

- fairness-adjusted consumption by household j is aggregated:

$$Z_j = \left[\int_0^1 Z_{ij}^{(\epsilon-1)/\epsilon} di\right]^{\epsilon/(\epsilon-1)}$$

- consumption index Z_j enters utility

$$\mathbb{E}_0\left(\sum \delta^t \left[\ln\left(Z_j\right) - \frac{N_j(t)^{1+\eta}}{1+\eta}\right]\right)$$

MISINFERENCE

- endogenize parameter C^b using past belief
- perceived marginal cost of good i in period t:

$$C_i^p(t) = \left[C_i^p(t-1)\right]^{\gamma} \cdot \left[\frac{P_i(t)}{\epsilon/(\epsilon-1)}\right]^{1-\gamma}$$

- $\gamma \in (0, 1]$: misinference

SHORT-RUN MONETARY NONNEUTRALITY

- 3 equilibrium variables: $\widehat{m^p}(t)$, $\widehat{n}(t)$, and $\widehat{\pi}(t)$
- belief dynamics: $\widehat{m^p}(t) = \gamma \cdot \left[\widehat{\pi}(t) + \widehat{m^p}(t-1)\right]$
- IS equation:

$$\alpha\widehat{n}(t) + \psi\widehat{\pi}(t) = \alpha\,\mathbb{E}_t\left(\widehat{n}(t+1)\right) + \mathbb{E}_t(\widehat{\pi}(t+1)) - s(t)$$

- short-run Phillips curve

$$(1-\delta\gamma)\widehat{m^p}(t) - \lambda_1\widehat{n}(t) = \delta\gamma\,\mathbb{E}_t(\widehat{\pi}(t+1)) - \lambda_2\,\mathbb{E}_t\left(\widehat{n}(t+1)\right)$$

- nonneutrality arises from Phillips curve
- evidence: Christiano, Eichenbaum, Evans [1999]; Ramey [2016]

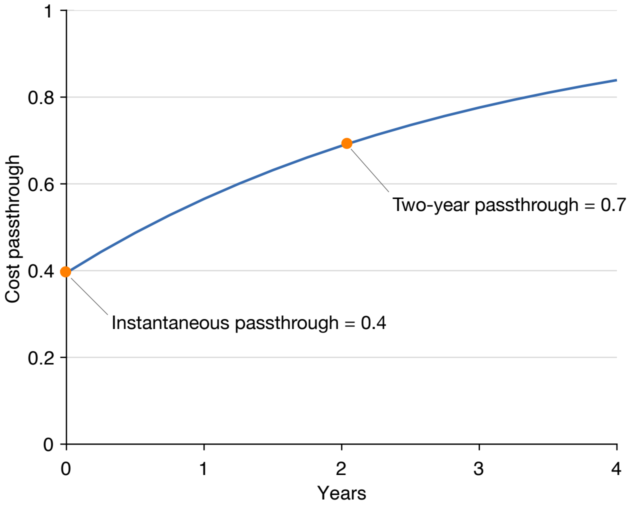
HYBRID SHORT-RUN PHILLIPS CURVE

- Phillips curve is forward-looking + backward-looking

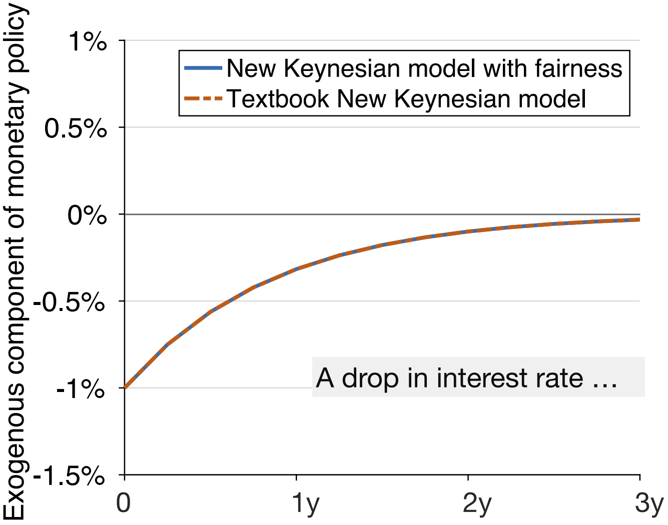
$$(1-\delta\gamma)\sum_{s=0}^{+\infty}\gamma^{s+1}\widehat{\pi}(t-s)-\lambda_1\widehat{n}(t)=\delta\gamma\,\mathbb{E}_t(\widehat{\pi}(t+1))-\lambda_2\,\mathbb{E}_t\left(\widehat{n}(t+1)\right)$$

- hybrid short-run Phillips curve is more realistic
  - inflation dynamics are more persistent
- evidence: Mavroeidis, Plagborg-Moller, Stock [2014]

CALIBRATION FROM PASSTHROUGH EVIDENCE



LOOSENING OF MONETARY POLICY



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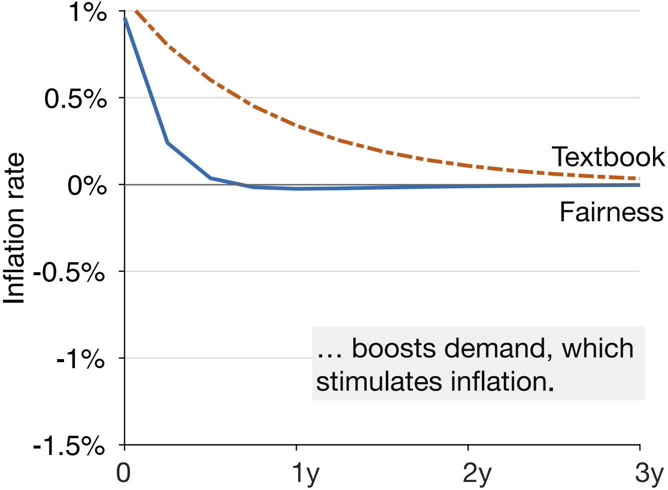

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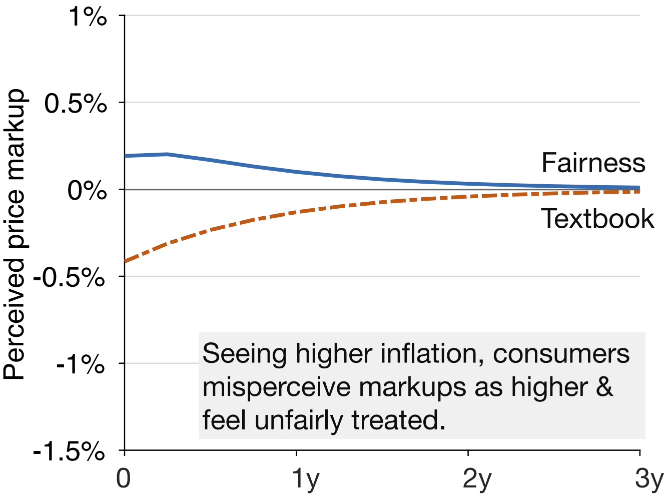

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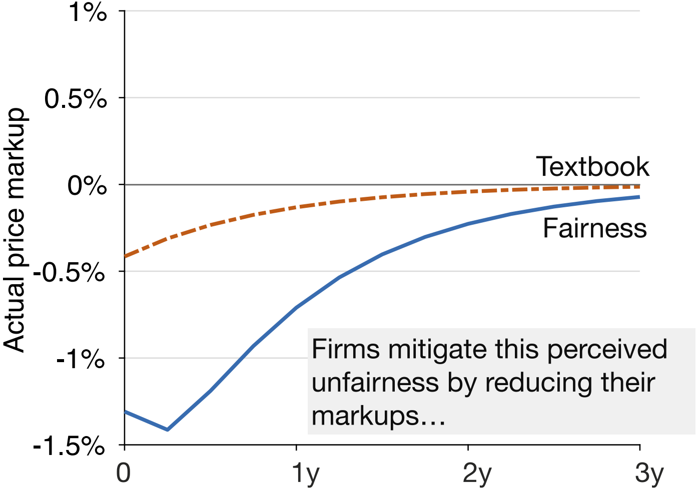

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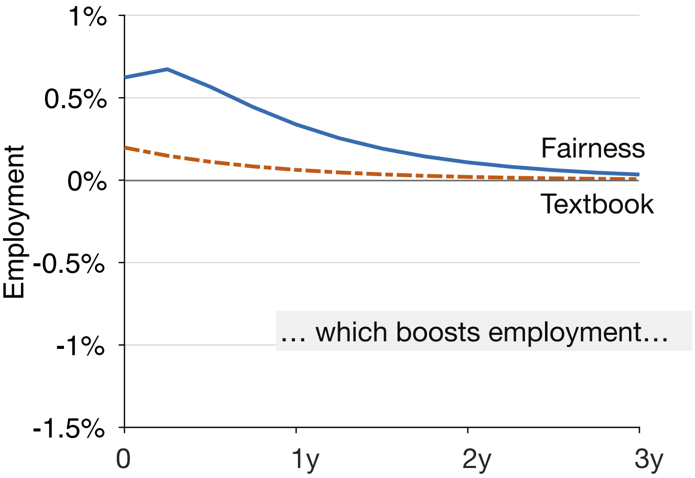

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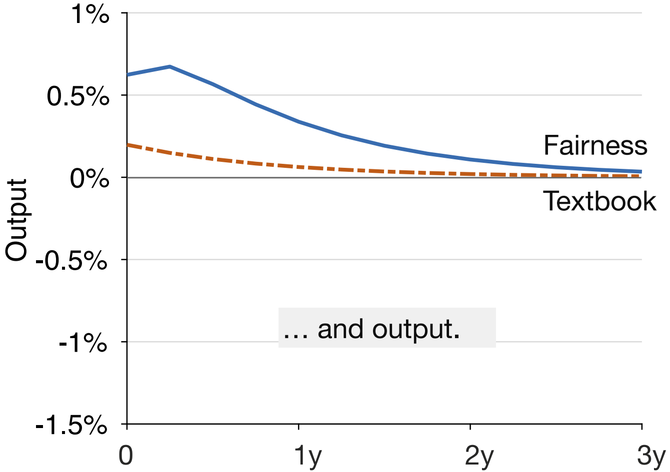


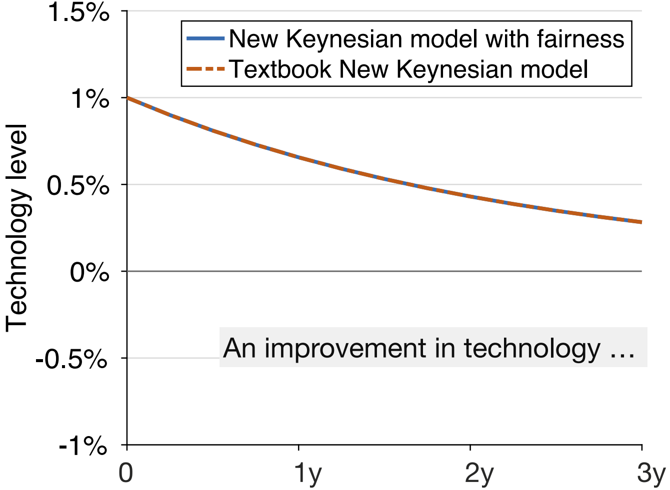
EXPLANATION FOR ANGER AT INFLATION

- Shiller [1997] surveyed 120 people in the US
- 85% said that “when they go to the store and see that prices are higher, they sometimes feel a little angry at someone”
- someone: “greedy store owners and businesses”

EXPLANATION FOR OPINIONS ABOUT PRICE MOVEMENTS IN JAPAN (BOJ SURVEY, 2001–2017)

perceived price change	favorable	neutral	unfavorable
prices have gone up ($N = 68,491$)	2.5%	13.0%	83.7%
prices have gone down ($N = 18,257$)	43.0%	34.2%	21.9%

IMPROVEMENT IN TECHNOLOGY



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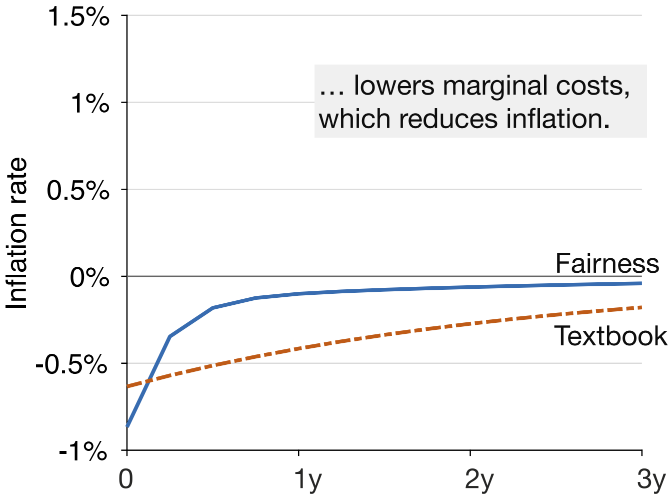

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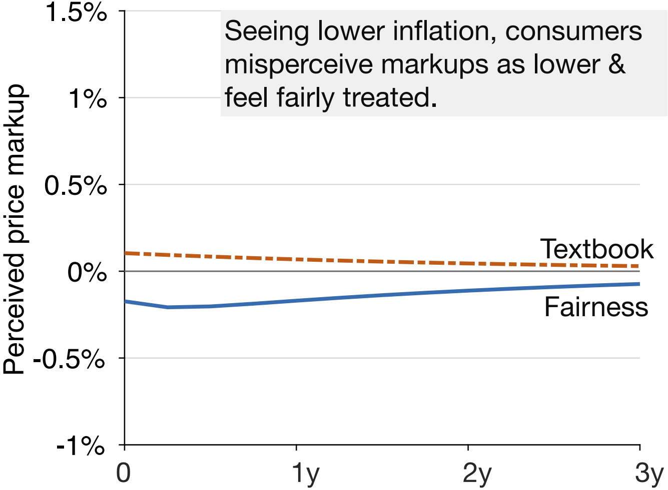

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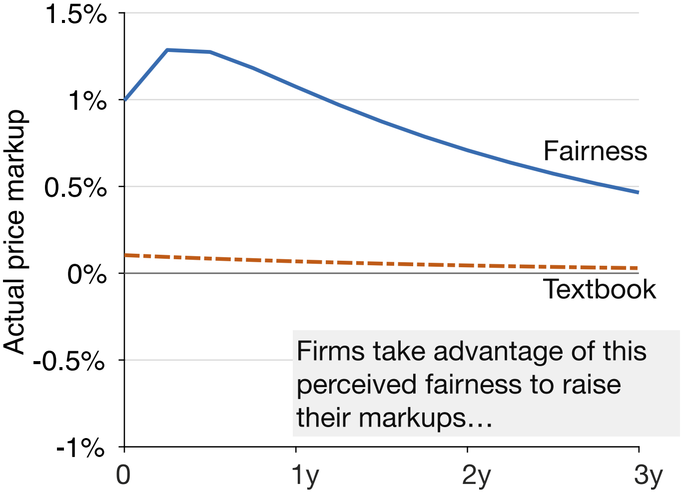

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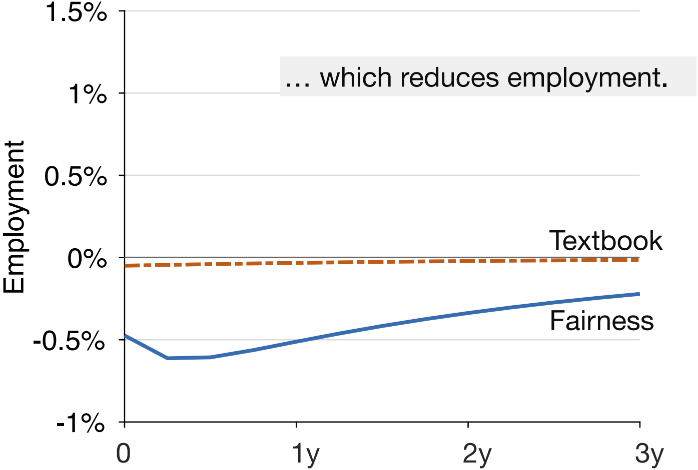

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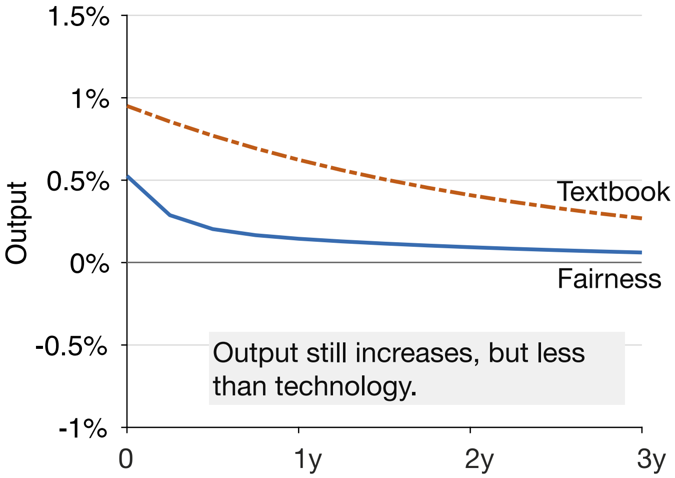


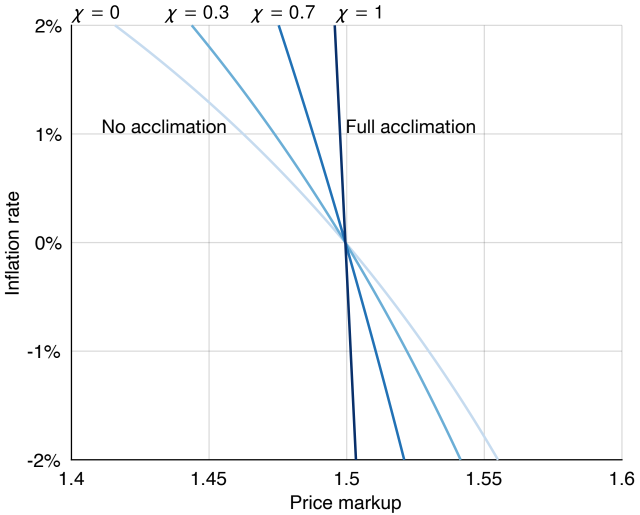
LONG-RUN MONETARY NONNEUTRALITY

- steady-state perceived markup:

$$\ln\left(\overline{M^p}\right) = \ln\left(\frac{\epsilon}{\epsilon - 1}\right) + \frac{\gamma}{1-\gamma} \cdot \overline{\pi}$$

- higher inflation $\rightsquigarrow$ higher perceived markup $\rightsquigarrow$ lower fairness $\rightsquigarrow$ lower actual markup $\rightsquigarrow$ higher output
- evidence of long-run nonneutrality: King, Watson [1994, 1997]
- evidence on inflation & markups: Benabou [1992]; Banerjee, Russell [2005]
- nonneutrality modulated by acclimation to inflation: $\chi \in [0, 1]$

LONG-RUN PHILLIPS CURVE



LONG-RUN PHILLIPS CURVE